REMARKS

Base claim 43 has been extensively amended, and now recites:

a) a straight tubular outer conduit concentrically disposed around an inner conduit to form a reaction chamber containing catalyst in the annular space between the outer conduit wall and the inner conduit wall, for conversion of hydrocarbon to industrial gases by reaction with steam, and an inner annular conduit defined path for the return flow of reactant gases to an exit means; said path located between radially spaced inner and outer annular regions of catalyst in said reaction chamber, said reaction chamber having one end that extends into the combustion chamber and an opposite end that extends outside of the combustion chamber, and there being inlet means for said gases that is in communication with said catalyst inner and outer regions, and wherein said exit means is in communication with the inner conduit defined path,

b) and a radiant burner having a heat radiating surface vertically disposed within said combustion chamber and having a gas permeable zone that promotes the flameless combustion of fuel and oxidant supplied to said burner in order to heat said surface of the burner to incandescence for radiating heat energy to the catalyst containing reaction chamber, which extends annularly about the burner surface,

c) and a convection chamber extending about a portion of the reaction chamber containing inner and outer annular regions of catalyst and in proximity to said inlet means to said exit means, said inner conduit wall, said outer conduit wall and said reaction chamber projecting annularly into said convection chamber, proximate an annular entrance of gases into the reaction chamber.

It will be noted in a) that the inner and outer conduits, as at 132 and 131 in Fig. 5, are defined as concentrically disposed; that the inner conduit is defined as annular and as defining a path for return flow of reactant gases to the exit means (as at 113); that the defined path is located between radially spaced inner and outer annular regions of catalyst in the reactor chamber; that the inlet means is in communication with such catalyst radially spaced inner and outer regions.

It will also be noted that in b) the radiant burner has a heat radiating surface, and that the catalyst containing reaction chamber extends about that burner surface; and it will be noted that in c) the convection chamber is defined as extending about a portion of the reaction chamber containing inner and outer annular regions of catalyst and in proximity to said inlet means, and to said exit means, said inner conduit wall, said outer conduit wall and said reaction chamber projecting annularly into said convection chamber proximate an annular entrance of gases into the reaction chamber.

Voecks is not suggestive as he lacks a return flow path for reactant gases, located between radially spaced inner and outer annular regions of catalyst in

his reactor chamber. (Voecks' return flow path 25 is not between radially spaced, annular, catalyst regions, since path 25 is outside his catalyst bed between his walls 22 and 24.) Also, Voecks lacks a radiant burner located as in b) above, and a convection chamber extending about a portion of a reaction chamber containing inner and outer annular regions of catalyst, since his catalyst bed is confined between walls 22 and 24. Also, gases enter his reaction chamber at one side location 60, and not annularly as defined in c).

Shirasaki is not suggestive, as he lacks suggestion of the underlined portions of a) of claim 43, above. Clearly, he lacks an inner annular conduit (as at 132 in applicant's Fig. 5) that defines a return flow path for reactant gases. In Shirasaki, the return flow path is defined by tubes, as at 32 and 34 in his Figs. 3 and 4, that project as seen in Figs. 1 and 2, with substantially less cross-sectional area for flow than is provided by applicant's annular structure. Shirasaki also lacks the radiant burner surface as defined in b) of claim 43, wherein the catalyst containing reaction chamber is defined as extending about the burner surface. See for example Fig. 1 in Shirasaki, showing burner 44 spaced well above the level of any catalyst. Also, Shirasaki lacks

suggestion of applicant's sub-paragraph c) defined convection chamber extending about a reaction chamber portion containing inner and outer annular regions of catalyst, since he has no such inner and outer annular catalyst regions, and his gases enter at one side location 48, and not annularly as in c).

No cited art suggests any motivation to re-construct and/or combine Voecks or Shirasaki to meet all of claim 43 multi-annular construction, as amended. Applicant's apparatus is more compact than the reference devices due to its multi-annular construction of all elements; and provides more efficient heat transfer to catalyst and gases flowing therein.

Dependent claims 44-48 add even further to the novel and unobvious totality, as claimed. Section '112 changes have been made.

In view of the above claim amendments and argument, allowance is believed justified and is respectfully solicited.

Respectfully submitted,

William W. Haefliger
Attorney for Applicant
Reg. No. 17,120
(323) 684-2707

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